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ABSTRACT

A brief, non-technical questionnaire was sent to 875 secondary school administrators (primarily principals) in the State of Illinois. Information was collected in four areas: (1) general school characteristics, (2) availability and use of computers, (3) perceived need for and qualifications of teachers of computer science, and (4) perceived need for introducing computer science as a separate discipline into secondary schools. Most of the 686 responses were from schools of less that 1000 enrollment and from communities of less than 5000, principally in downstate Illinois. Of these, 51% had computer facilities. Eighty percent of these teach computer programing and data processing and 46% use computer programs with instruction (i.e., math, science, English). Of the total (686), 71% perceive a need for computer teachers and 55% perceive a need for state certification, though only 47% felt some computer science should be in every teacher's background. (DAG)

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Number 24

The Illinois Series on

Educational Application of Computers

COMPUTER ACTIVITIES IN ILLINOIS SECONDARY SCHOOLS

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COMPUTER ACTIVITIES IN ILLINOIS SECONDARY SCHOOLS

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Schools today are experiencing steadily rising costs, trends toward declining enrollments, and other events which translate into budget erosion. In such a climate, equipment purchases usually are among the early casualties. Despite this, schools are expending more and more of their resources to computerize their information management procedures and some instructional activities.

At the national level this has been demonstrated by several surveys in recent years. In 1970, and again in 1975, the American Institute of Research (AIR) conducted surveys based on a sampling of secondary schools in the United States.(1) The 1970 survey found 34.4% of the secondary schools using computers in some way, either for administrative applications, for instructional applications, or for both of these. By 1975, when the survey was repeated, secondary school use of computers had grown to 58.2%. This represents an average annual rate of increase of 4.8% among schools using computers. Administrative computing had grown from 30.5% to 53.3% of the schools in this period of time. Instructional computing had increased from 12.9% to 26.7%. On the basis of this data, the AIR study projected that by about 1984 all schools would be using computers for some type of activity. Of course, this assumes a linear rate of growth which may or may not continue.

We are interested in assessing educational computing in secondary schools on a regional basis. An assessment is presented here of computer activities in the secondary schools in the state of Illinois.

PROCEDURES

In order to measure the extent of computer activity among secondary schools of Illinois we prepared a brief, non-technical questionnaire, addressed to secondary school administrators (primarily principals).* The questionnaire contained eight basic questions, some of which had several parts, for a total of fifteen items requiring response. Only two of these items specifically asked for opinions, comments, or explanations.

Information was collected in four areas:

1) The general characteristics of the school and local community (number of students, location of schools, population of community).
2) The availability, types of use, and specific instructional applications of computers within the school.
3) The perceived need for teachers of computer science, what their qualifications should be, and how valuable experiences in computer use might be in terms of employability (for any teacher).
4) The perceived need and urgency of introducing computer science as a separate discipline into the secondary schools.

The questionnaire was sent to the principals of all 875 secondary schools in the State of Illinois.** Accompanying the questionnaire was an explanation of the purpose of the study. It was stressed that all of the information collected from the questionnaire would be confidential (except for use in an

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* A copy of the questionnaire may be obtained by writing the authors.

** As defined by the Survey Research Laboratory, University of Illinois, Urbana, Illinois.

anonymous summary form as a basis for statistical analysis), and that the identification number present on each survey would be used only for follow-up purposes. Respondents were encouraged to express additional comments or opinions.

All of the questionnaires were mailed late in November of 1976. In mid-January of 1977, a follow-up letter and duplicate copy of the questionnaire were sent to all those schools which did not respond to the initial questionnaire.

RESULTS

The results of this 1976 survey of Illinois secondary schools are summarized in Tables 1-5 following. Of the 875 schools contacted, 686 responded, representing a return of 78.4%.

Current School Enrollment	Under 1000	63%
	1000 - 3000	30%
	Over 3000	6%
	No response	1%
School Location	Chicago City	15%
	Chicago Suburb	19%
	Downstate Ill.*	63%
	No Response	2%
Population of the Community	Chicago Metropolitan	31%
	Under 5000	40%
	5000 - 9999	9%
	10,000 - 39,999	10%
	Over 40,000	9%

Table 1: General Information about the school (N=686)

* Most of these schools are rural or small town schools, with the exception of schools in a few larger cities such as Springfield, Decatur, Peoria, Bloomington, etc.

Are there computer facilities?		If yes, since when?	
			Number of Schools
Yes	51%	Before 1967	43
		1967	22
No	46%	1968	30
		1969	23
No response	3%	1970	49
		1971	21
		1972	22
		1973	23
		1974	35
		1975	25
		1976	14

How are they made available?

	Of All Schools In The State	Of All Schools With Computer Facilities
Rental	17%	33%
Leasing (with option to purchase)	5%	10%
Ownership	15%	29%
Over phone	13%	25%
Pick-up and delivery arrangements	7%	14%
Other (primarily taking students to use facilities at a nearby junior college, university, or business)	7%	14%

Table 2: Information On Computers Within The School (N=686)

Type of Application(s)	Administrative only		14%
	Instructional (with possible administrative)		35%
		Of All Schools In the State	Of All Schools With Instructional Applications (N=243)
Specific Instructional Applications (For schools with computer facilities)	Teaching Computer Programming	29%	81% (N=198)
	Teaching Data Processing	28%	80% (N=194)
	Using Programs with instruction (in subjects like math, science, or english)	16%	46% (N=112)
	For test grading	7%	21% (N=50)
	Other*	6%	17% (N=41)

Table 3: Information On Type of Computer Use (N=686)

* Frequent items listed were "hands-on" time for advanced students, test and worksheet construction, and use of specialized programs--such as in the area of guidance counseling. Also listed were administrative applications such as scheduling and record-keeping.

Is there a need for computer science teachers?	Yes	71%
	No	26%
	No response	3%
Do we need state certification in computer science?	Yes	55%
	No	40%
	No Response	4%
Value of some computer science in the background of any teacher.	Very Valuable	35%
	Somewhat Valuable	47%
	Not At All Valuable	14%
	No Response	4%

Table 4: Information Regarding Computer Science Teachers (N=686)

High Priority	27%
Medium Priority	38%
Low Priority	31%
No Response	4%

Table 5: Priority of Computer Science As A New Subject Are (N=686)

FINDINGS

In viewing the data, several interesting observations can be made. These include the following:

1. Only 10% of the Illinois schools lease their computer equipment.
2. There has been a relatively steady growth in the number of schools acquiring computer facilities since 1967 (with a notable exception in 1970).

3. Even though 71% of the administrators felt there was a need for computer science teachers, only 55% of them favored certification requirements in the subject area.
4. The administrative-only use of computers appears low relative to the AIR national survey (14% in Illinois, 31.5% nationally). However, instructional uses (with possible administrative uses) are greater than might be expected. The AIR national study found 26.7% of the schools reporting instructional activity. In Illinois, 35% of the schools reported such activity.
5. The level of computer use varies with the size and location of the school, as well as the population of the surrounding community.
6. The availability of computer resources has an effect upon the attitudes expressed by administrators towards all of the computer science related issues except certification.

DISCUSSION

Earlier studies (Oliveri, 1976) have shown that leasing agreements (with purchase option) tend to be almost as popular as rental plans or purchase arrangements for securing equipment. (Oliveri's study used a much smaller sample than the Illinois study, 40 secondary schools in Massachusetts.) Oliveri found 28% of the schools having computer facilities acquired them through leasing, while 36% of the schools owned their equipment and 36% of the schools rented. In Illinois, only 10% of the schools with computer resources leased their equipment while 29% of the schools owned, and 33% of the schools rented

equipment. These findings are counter to predictions in this matter. Despite an attempt to distinguish rental plans from lease (with option) plans, we suspect that there may have been a continuing confusion on the part of the respondents that has skewed these results.

The A R study found an average growth rate in the number of secondary schools using computers to be 4.8% per year for the period from 1970 to 1975. In the Illinois study, only 307 out of the 348 schools which reported computer facilities indicated the year they began their computing activity. If we assume that the 41 remaining schools are distributed in roughly the same proportion as the schools that responded, then Illinois has experienced an average growth rate of 4.8% per year for the period from 1970 to 1975, and an overall average growth rate from 1967 to 1976 of 4.4% per year (based on the 686 schools returning the questionnaires).

Results of the questions on the need for secondary school computer science teachers and the need for state certification guidelines in computer science are related in Table 6.

		Do we need state certification in computer science?		
		Yes	No	No Response
Is there a need for computer science teachers?	Yes	47%	22%	2%
	No	7%	18%	1%
	No Response	1%	1%	2%

Table 6

Many of those expressing a need for computer science teachers felt that there was a need for the certification of computer science teachers, if computer science becomes a common high school subject. This is a somewhat chicken-and-

egg position. Many reasons were given for the perceived need for computer science teachers but no perceived need for certification in the subject. There was a general feeling among those not desiring certification that computer science was too specific an area, and that teachers in other subjects (particularly mathematics and business) could teacher computer courses. Some felt that the computer science curriculum at the high school level would have to be very elementary, and therefore would not require extensive training. Others felt that practical experience with computers was essential, and that teachers might not be adequately qualified without it. Also, a school might offer only one or two computer science courses, and the teacher of those courses would be required to assume other responsibilities for the greater portion of the time (probably in teaching more conventional subject areas).

Assuming that teachers were trained in computer science, it was felt that many of them would decide to go into industry rather than teaching. The major reason for this opinion is salary differences. This tendency would make it difficult to recruit teachers in computer science (similar to the problems being experienced in the field of vocational-technical education). Concern was expressed over the relevance of material learned in high school classes, as well as the differences in computer training available at different institutions (based on the perception that the field of computer science still is changing rapidly). Some principals felt that computer science should entirely be left to the junior colleges, trade schools, and four-year institutions. Still others felt that it was too premature to adopt guidelines in computer science, that such efforts should be postponed for a few more years.

Some administrators were concerned that certification might bring with it some undesirable consequences, including:

--difficulty in getting qualified people to start a program,

--certification might lead to state-mandated computer offerings (e.g. computer literacy units) which some schools would have great difficulty providing.

--certification in computer science might limit the involvement of a number of teachers from other subjects who would otherwise be willing to get involved with the computer.

As noted earlier, the 1975 AIR study found a average of 31.5% of the secondary schools using computers only for administrative purposes, and 26.7% of such schools using computers for instructional (and possibly administrative) purposes. The Illinois rate of 35% for instructional (with possible administrative) uses is high in comparison with the national picture, while a rate of 14% for administrative-only applications in Illinois is comparatively low. There are two possible explanations for this situation:

1) More schools are using computers for both instructional and administrative purposes once they gain access to computer facilities;

2) Since 63% of the schools in our survey are relatively small (less than 1000 students). It may be that many of the administrative applications possible on computers are still too expensive for small schools to consider a change from manual operation.

Neither of these conjectures is firmly supported by evidence from this study.

Our study indicates a variety of differences in computer usage and perceived needs across geographic location, size of school, and community population. These results are presented in more detail in Table 7. Each entry in Table 7

consists of two percentages. For example, the entry in the first row and first column is 79% (11%). This is interpreted as follows:

79% of all the schools that are in the city of Chicago responded "yes" to the question asking if there are computer facilities available to the school;

11% of all the schools that are in the State of Illinois happen to fall into this category (they are in the city of Chicago and do have computer facilities available).

The entry in the fifth row and fourth column is 63% (40%). This is interpreted as follows;

63% of all schools with enrollments of under 1000 students said there is a need for high school computer science teachers;

40% of the schools that are in the State of Illinois have enrollments of under 1000 and feel there is a need for high school computer science teachers.

		Are computer facilities available to school?			In there a need for high school computer science teachers?			Does the state need certification guideline in computer science?		
		Yes	No	No Response	Yes	No	No Response	Yes	No	No Respon
Location	Chicago City	79% (11%)	21% (3%)	0% (0%)	86% (12%)	14% (2%)	0% (0%)	47% (7%)	47% (7%)	2% (1%
	Chicago Suburb	89% (17%)	11% (2%)	0% (0%)	85% (17%)	10% (2%)	5% (1%)	53% (10%)	42% (8%)	5% (1%
	Downstate Ill.	34% (22%)	64% (41%)	2% (1%)	63% (40%)	34% (22%)	3% (2%)	58% (37%)	39% (25%)	3% (2%
	No Response	100% (1%)	0% (0%)	0% (0%)	33% (1%)	33% (1%)	33% (1%)	50% (1%)	0% (0%)	50% (1%
School Size	Under 1000	29% (18%)	70% (44%)	1% (1%)	63% (40%)	33% (21%)	1% (2%)	56% (35%)	40% (25%)	4% (3%
	1000 - 3000	87% (27%)	10% (3%)	3% (1%)	84% (26%)	13% (4%)	3% (1%)	52% (16%)	45% (14%)	3% (1%
	Over 3000	100% (5%)	0% (0%)	0% (0%)	100% (5%)	0% (0%)	0% (0%)	60% (3%)	40% (2%)	0% (0%
	No Response	0% (0%)	0% (0%)	100% (1%)	0% (0%)	0% (0%)	100% (1%)	0% (0%)	0% (0%)	100% (1%
Community Population	Under 5000	20% (8%)	80% (32%)	0% (0%)	59% (24%)	39% (16%)	2% (1%)	56% (23%)	39% (16%)	5% (2%)
	5000 - 9999	40% (4%)	50% (5%)	10% (1%)	67% (6%)	33% (3%)	0% (0%)	67% (6%)	33% (3%)	0% (0%)
	10,000 - 39,999	78% (7%)	22% (2%)	0% (0%)	78% (7%)	22% (2%)	0% (0%)	56% (5%)	44% (4%)	0% (0%)
	40,000 and over	78% (7%)	22% (2%)	0% (0%)	78% (7%)	22% (2%)	0% (0%)	60% (6%)	40% (4%)	0% (0%)
	Metropolitan Area	81% (25%)	16% (5%)	3% (1%)	90% (27%)	7% (2%)	3% (1%)	50% (16%)	44% (14%)	6% (2%)

Table 7

In general, the larger the school (or community) the greater the likelihood that the school will have access to computer facilities. This comes as no great surprise. Since Illinois primarily consists of small schools and small communities, we should not be surprised to find that our average computer usage figure (51%) is below the averages found by Bukoski and Korotkin (58.2% in 1975) and Oliveri (57.9% in 1975). Bukoski and Korotkin used random samples from schools throughout the United Sates, and Oliveri conducted his study in Massachusetts (which generally is more densely populated than Illinois). The data of Table 7 is presented in still another manner in Table 8.

		Are computer facilities available to school?		
		Yes	No	No Response
Is there a need for high school teachers of computer science?	Yes	41%	28%	2%
	No	8%	18%	0%
	No Response	2%	1%	1%
Does state need certification requirements in computer science?	Yes	28%	26%	2%
	No	22%	18%	0%
	No Response	2%	2%	1%
Priority of computer science as a new high school subject area?	High	21%	6%	0%
	Medium	19%	18%	1%
	Low	9%	22%	0%
	No Response	2%	1%	1%
Value of a computer science background for a prospective teacher?	Very	23%	11%	1%
	Somewhat	21%	25%	1%
	Little	4%	9%	0%
	No Response	2%	1%	1%

Table 8

From this analysis, we can see that schools which have computer facilities available to them generally tend to:

--see a need for computer science teachers

--look favorably upon computer-related experiences in the backgrounds of prospective teachers

--favor the introduction of computer science into the high school curriculum.

On the other hand, schools which do not have computer facilities available to them generally tend to:

--see a need for computer science teachers (but to a smaller degree)

--look less favorably upon computer-related experiences in the backgrounds of prospective teachers (though they still prefer it)

--be against the introduction of computer science into the high school curriculum.

All schools seem to share similar reactions to the question of certification of computer science teachers.

In terms of introducing computer science as a new subject area into the high school curriculum, some of the reasons given for a low priority to such moves included, of course, cost and space limitations. Other reasons given included:

1) computer science was already being taught at the school
2) both students and/or the community have expressed little or no interest for such a program (often auto mechanics or vocational-technical education were listed as taking higher priority in farm communities.)

3) the feeling that computer science should be able to fit into the mathematics curriculum
4) the feeling that what is really needed are computer literacy requirements, not computer science requirements
5) high schools could not support an extensive computer program
6) students do not have enough free electives to fit computer science into their schedules.

Some schools said that training in computer science was available to their students outside of the school, and that establishing a computer science offering would only be a needless duplication of effort.

In terms of the perceived value of experiences in computer science for influencing the hiring of a teacher, many respondents qualified their answers by saying that such experience would only be applicable to mathematics, science, and business teachers. They felt practical experience was more valuable than simply classroom exposure. Many felt that a major in one of the traditional teaching areas, along with a minor in computer science would be the ideal compromise.

SUMMARY

As of 1976, about half of the secondary schools in the State of Illinois had some kind of computer facilities available to them. There has been a relatively steady growth in the number of Illinois schools using computers since 1967, but the growth has not been uniform throughout the state. The growth of computer use has been most rapid in large, urban schools. Small, rural schools do not acquire computer facilities as rapidly, primarily because of lack of funds, space limitations, and little or no perceived student interest.

In general, schools that have computer facilities available to them feel that:

1) there is a need for computer science teachers (81% of the schools that have computer resources used in instruction also teach computer programming)
2) computer science has a higher than average priority for being introduced as a new subject area in the high schools
3) it is valuable for teachers to have a background that contains some computer-related experiences (preferrably practical experience using computers, and mostly for mathematics, science, and business teachers).

Schools that do not have computer facilities available to them also feel that there is a general need for computer science teachers, and that a computer background for teachers would be valuable, but they generally are not as strong in this feeling as the schools with computer facilities. Most of the schools without computer facilities set a low priority for the introduction of a computer science as a new subject area for the high schools.

A similar opinion exists among all schools regarding the establishment of certification requirements in the area of computer science, regardless of whether or not they have computer facilities. More schools are in favor of certification than oppose it, but a significant number of schools are against establishing certification guidelines (40%). The reasons for this hesitancy toward state certification guidelines include the fear that with certification will come more state mandated requirements, the feeling that teachers from areas like mathematics, science, or business could teach computer science courses, and the feeling that computer science is too specific an area.

This survey has provided a regional picture of educational computing in the Illinois secondary schools. This picture can, of course, be misleading because of what a certain school may mean by reporting that instructional computing is in progress. The school's instructional program may involve--one to several teachers, a few independent study students to planned activities for all students, or a few experiences in one course to several semesters of sequential experiences. The Illinois study did not attempt to distinguish these levels in the present survey. However, we now are in the process of a follow-up survey to the schools reporting instructional computing to determine the extent of activity in specific subject areas and/or departments of the schools. Results of this more detailed study will be reported in the near future.

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